

# Negotiation Support Systems

An Overview

# History (1)

- RAINS (MIT, Nyhart, 1976)
  - Started as a cost model of deep ocean mining (simulation tool)
  - used by UN for negotiations
  - helped negotiating parties to get insights in to the problem under negotiation
  - few modifications were made in 90s to adopt other domains

# History (2)

- GroupSytems (Univ. of Arizona, 1986, sold to IBM)
  - used in union-management negotiations
  - an electronic meeting systems (face-to-face communication, meeting transcripts, docs, etc.)
  - also provided support for three-step integrative bargaining:
    - exploration of issues
    - Ranking of issues
    - Construction of criteria (through e-brainstorming)

# History (3)

- NEGO (Kersten, 1985)
  - developed to train members of Polish Solidarity trade union
  - was never used in practice
  - 2-8 users
  - linear constraints: soft and hard
  - hard constraints (resources, production capacity)
  - system proposed a set possible agreements that match all constraints

# History (4)

- Time of decision making theory:
  - multi-criteria/multi-attribute/multi-objective
  - can be easily extended from single to multiple decision makers
- MEDIATOR (Jarke et al. 1987)
  - Comparison of preferences and utilities of the negotiating parties by a third party
- Analytical hierarchy process (AHP)
  - HIPRE and Web-HIPRE (Hamalainen 1996)
  - RAMONA (Teich 1991)

# History(5)

- Game theory (few cases):
  - Have not been implemented in many systems
  - Conflict analysis program (CAP)
  - Graph model for conflict resolution (GMCR)

# History (6) – First NSS

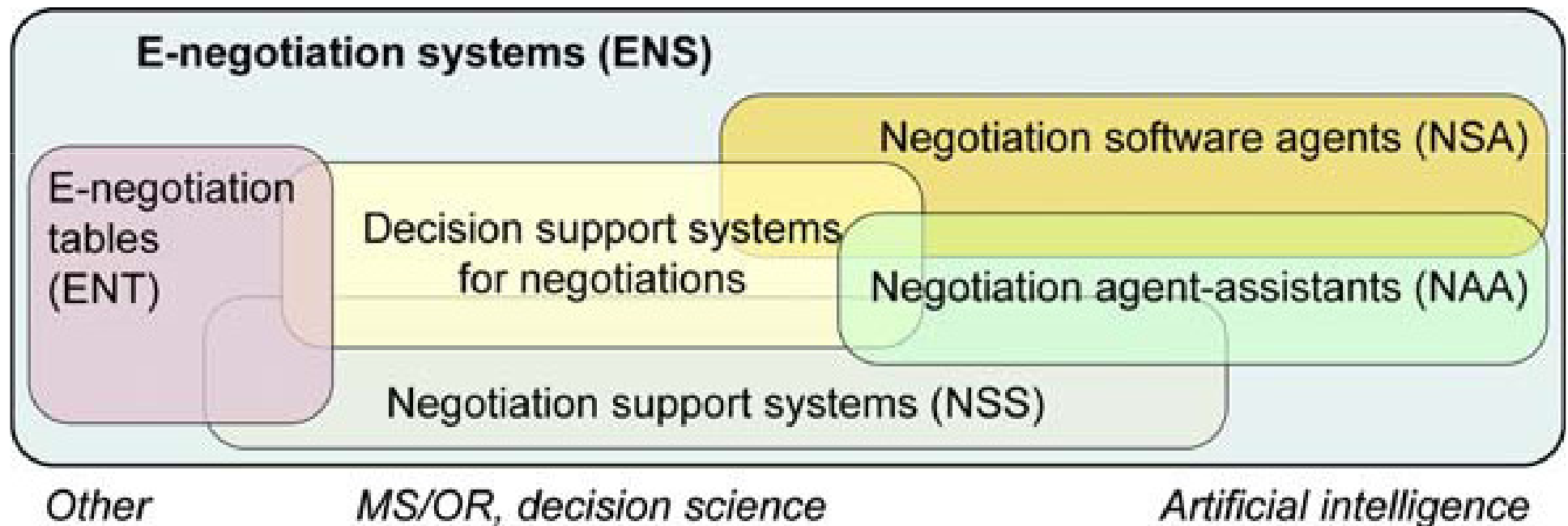
- Moskowitz (1981)
  - 6-10 persons in a collective bargaining situation
  - No computer!
  - focus: problem formulation and generation of alternative contracts
- Delaney et al.(1997)
  - Compared three systems: (1) NSS, (2) DSS, (3) no support
  - Results: DSS improved joint outcomes; NSS reduced negative climate and increased users' satisfaction

# History (7) “.com revolution”

- In 90s many .com enterprises appeared with a mission to facilitate negotiations in B2B setting
- Main functionalities:
  - Partner selection
  - Negotiation table (exchange of offers, communication between parties)
  - Bidding bots
  - Mediation
- Most of the .com links do not work any more... (mediation sites survived somehow)



# Overview



# Modern World (1)

- Invite (Gregory Kersten)
  - Flexible w.r.t. the protocols
  - SimpleNS
  - Inspire, INSS, Imbins, InAuction...
  - Aspire
    - Inspire with an advisory agent (neural network trained on historical data)
- Inspire (Gregory Kersten, 2004)
  - Three phases: pre-negotiation, negotiation, post-settlement
  - Utility functions
  - Verification of preference profile
  - Users can attach text messages to offers
  - If agreement is inefficient, the system suggests a post-settlement
  - Used to study role of culture in e-negotiations:
    - Verbal communication
    - Importance of verbal communication
    - Importance of analytical tools

# Modern World (2) - Aspire

- Aspire = Inspire + Atin
  - Atin is a software agent
  - In pref. elicitation Atin warns user in case of wrong input, i.e. if user assigns equal weights to the issues
  - Atin monitors user's negotiation process
  - Atin uses a neural network to learn from previous negotiations
  - Atin can suggest an offer to be made by the user

**Atin** suggests:

[About Atin](#)

**Gordon**, based on your inputs I suggest the following opening offer:

**Price:** \$ 3.47

**Delivery:** 30 days

**Payment:** 60 days after delivery

**Returns:** Full price

Your **Utility Rating** for this offer: 100

I would also suggest you to append a message with:

1. Reason for this offer
2. Ask for information about the opponent's priorities AND
3. Indicate lack of your willingness for prolonged negotiations AND
4. Tell about others with whom you can make business

[More](#)

Done Reading

# Modern World (2)

- eNAs e-Negotiation Agency (R. Kowalczyk)
  - One-to-one, one-to-many, many-one-to-one, many-one-to-many negotiations
  - (Fuzzy) constraint-based reasoning
  - Multi-attribute utility theory
  - Heuristic negotiation strategies
  - Qualitative decision-making with opponent modeling (Brzostowski and Kowalczyk, 2006)
  - Case-based reasoning for partner selection

# Modern World (3)

- meet2trade (Christof Weinhardt, Univ. Karlsruhe)
  - Auction platform
  - Supports design of new auction protocols given a desired goal
  - GUI is automatically generated for a specific auction protocol
  - Has a simulation environment
- GoGo Group-Buying Platform (Hsiangchu Lai)
  - A group of buyers negotiates with a single seller
  - Negotiation vs auction decision support
- Shaman:
  - Combine Invite, eNAs, meet2trade, GoGo in one system
  - Develop integration interfaces between the systems
  - Design software agent that would support humans

# Conclusions

- Modeling of a negotiation case is important
- Role of a software agent in negotiation: user should feel that he/she is in control of negotiation
- Mediation is a survivor
- Most of the systems studied here are research environments